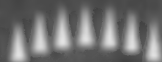


FGC 

Forest Genetics Council
of British Columbia

STRATEGIC PLAN
2009–2014



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Cover Photos:

Western larch orchard
operated by the HFR and
supplying seed for the Nelson
seed zone.
Chris Walsh

Douglas-fir flowers at the
stage of pollen receptivity.
Jack Woods

Interior spruce seed.
Jack Woods

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FGC Strategic Plan 2009–2014

Statement of Purpose

This Strategic Plan outlines the vision, scope, objectives, roles and responsibilities, and operating principles for conserving and managing BC's forest tree genetic resources for the period 2009 to 2014. It also sets out a business planning structure and goals for the Forest Genetics Council of British Columbia (FGC), a multi-stakeholder advisory group reporting to the provincial Chief Forester.

Background

Forest genetic resource conservation and management (GRM) in British Columbia is a shared responsibility between the government of the province of BC, private forest companies operating on Crown land, academia, and the federal government.

GRM has historically been coordinated through cooperative councils, beginning with the Plus Tree Board in the 1960s. GRM activities are presently led by the Forest Genetics Council of British Columbia (FGC), which consists of representatives from the BC Ministry of Forests and Range, forest industry, universities, and the Canadian Forest Service. The FGC advises the Provincial Chief Forester on policy, priorities and business planning for publicly-funded GRM investments, and coordinates GRM-related activities among stakeholders.

This strategic plan is informed by an extensive dialogue undertaken with members of the GRM community of practice, stakeholders, and the public between 2006 and 2008. Background information and outcomes from this dialogue may be viewed at:

http://www.for.gov.bc.ca/htl/grm/grm_dialogue.htm



Douglas-fir orchard operated by Vernon Seed Orchard Company in partnership with SelectSeed Ltd., and supplying seed for the Quesnel Lakes seed zone.

Photo Jack Woods

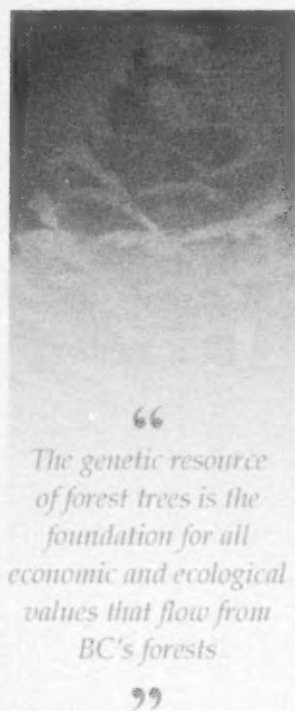


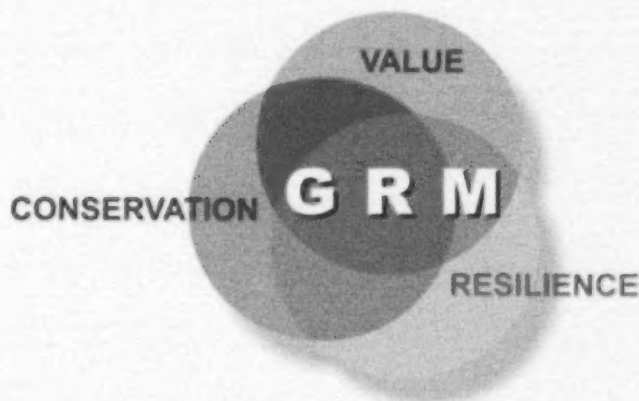
Figure 1
Three primary
components of Genetic
Resource Management

Genetic Resource Conservation and Management

Genetic resource conservation and management (GRM) seeks to protect and conserve the genetic foundation of BC's public forests to provide for their continued evolution and development to meet human needs and to provide environmental services. The genetic resource of forest trees is the foundation for all economic and ecological values that flow from BC's forests.

GRM consists of three primary and integrated components (Figure 1):

- **Conservation**, the maintenance of natural levels of genetic diversity for all tree species indigenous to BC;
- **Resilience**, matching seed (genotypes) to planted sites (environments), and maintaining natural genetic diversity in planted populations of trees; and
- **Value**, increasing the timber and non-timber economic value of planted forests.



Stewardship of the province's forest tree genetic resources is vested with the Ministry of Forests and Range, and the province's Chief Forester. The *Forest and Range Practices Act* and regulations, and the *Chief Forester's Standards for Seed Use* govern tree seed use for the establishment of free growing stands on Crown land. These include requirements for seed collection, production, registration, storage, selection, transfer and reporting.

To fulfill their respective mandates, the Ministry of Forests and Range and the Chief Forester sponsor GRM activities through the FGC, internal programs, and other institutions. Support for GRM activities is also provided by the Forest Investment Council of BC through the provincial Forest Investment Account.

GRM as part of sustainable forest management

Sustainable forest management (SFM) maintains and enhances the long-term health of forest ecosystems for the benefit of all living things, while providing environmental, economic, social, and cultural opportunities for present and future generations. SFM sets the broad context for GRM goals and objectives, while GRM is one of the essential components of SFM. As such, this strategy is linked with other SFM-related initiatives, such as Biodiversity BC and the Ecosystem Conservation Framework.

Scope

The following outlines the scope of this Strategy with respect to land base, species, values, new technologies, and timeframe.

- **Landbase:** This strategy applies to all forest land in BC (public and private), with a primary focus on Crown lands within the provincial forest. It also recognizes that areas outside the timber harvesting land base on Crown land, such as parks and protected areas, and private land conservancies, contribute to provincial genetic conservation objectives.
- **Tree species:** As trees are the leading flora influencing ecosystem processes in forests, conservation of the genetic diversity of indigenous tree species is a key part of maintaining the long-term economic and ecosystem services provided by forests. This strategy focuses on BC's 50 indigenous tree species, including 15 commercial timber species and 35 non-timber species. Some non-indigenous species are also considered.

Indigenous and non-indigenous species are defined as follows:

- **Indigenous species** - are species native to BC, within their present natural range.
- **Non-indigenous species** are defined in two categories; **indigenous non-local** - species indigenous to western North America whose range could naturally expand or be moved to new geographic areas (i.e. noble fir range expansion into British Columbia, or the northerly migration of Douglas-fir or western larch to areas in BC where they are not currently found), and **exotic species** - species not native to western North America (i.e. Siberian larch).

Some non-indigenous tree species may be suitable for use on Crown lands where they offer exceptional timber or ecosystem values, and the benefits, costs, and environmental risks have been fully assessed. The use of non-indigenous species, however, is a land-use issue which is beyond the scope of this strategy and the mandate of the FGC.



“
Conservation of the
genetic diversity of
indigenous tree species
is a key part of
maintaining the long-
term economic and
ecosystem services
provided by forests
”

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The development of trees with novel traits, including genetically modified trees, is not within the scope of this plan

99

Lodgepole pine cones harvested from an orchard in the Kettle Valley.

Photo Jack Woods

- **Timber and non-timber values:** The genetic characteristics of tree species support important timber and non-timber values. They can also provide other important ecological and societal services such as bioenergy and carbon sequestration. This GRM strategy, acknowledges values other than timber and is responsive to broader SFM objectives in this context.
- **New technologies:** The development and application of new technologies is within the scope of this GRM strategy, however, this strategy will focus on technologies close to the implementation phase, with clear linkages to ongoing activities such as tree breeding and field testing. The development of plants with novel traits (PNTs), including genetically modified organisms, is not within the scope of this plan. However, should PNT opportunities arise through other research, controlled testing may be carried out with due consideration for environmental and ethical issues and for existing federal law concerning the testing and release of PNTs.
- **Timeframe:** Program development under this strategy will consider the impacts of management activities over long timeframes (100+ years). Timeframes for specific GRM strategies must be sufficiently flexible to support short- and longer-term objectives, as follows:
 - FGC strategic plans and business cycles will be established and evaluated on 5-year cycles
 - Support for breeding programs and seed orchard production must follow approximately 20 year cycles
 - Evaluation of program impacts on timber production and future forest conditions is required on approximately 50-100 year (rotation age) cycles



Vision and Objectives

Vision statement

BC's forest genetic resources are diverse, resilient, and managed to provide multiple values for the benefit of present and future generations.

Conservation outcome and objective

Outcome: The genetic structure and diversity of all indigenous tree species are adequately maintained to support their continued evolution while providing environmental services and social and economic values.

OBJECTIVE 1

Adequately conserve the genetic diversity of key populations of all forest tree species native to BC by 2015, through a combination of *in situ*, *ex situ*, and *inter situ* conservation.

Effective genetic conservation requires knowledge of population, ecological, and quantitative genetics, a comprehensive inventory of the forest-tree genetic resource, and the systematic identification of species and population priorities for additional conservation. The FGC will support the development and maintenance of a catalogue of the conservation status for all 50 naturally occurring tree species across scientifically defined seed zones. Where the genetic diversity of a species within a zone is determined to be at risk, appropriate measures for *in situ*, *ex situ*, *inter situ*¹ genetic conservation will be supported, or recommendations made to appropriate agencies. To meet this objective, the following will be undertaken in the period of this plan:

- Complete the cataloguing of the *in situ*, *ex situ* and *inter situ* status of BC's 50 native tree species,
- Develop conservation priorities and conservation strategies for species whose genetic diversity is determined to be at risk,
- Implement conservation measures for species or populations of concern.

Reporting: Progress towards achieving adequate conservation of 100% of indigenous tree species within key subdivisions of genetic diversity, such as seed zones and biogeoclimatic subzones, will be assessed and reported annually.

¹ *In situ* genetic conservation is the maintenance of genetic diversity within naturally occurring tree populations. *Ex situ* genetic conservation is the long-term storage of germplasm, typically seeds, in a seed bank, or the maintenance of clonobanks of selected tree populations. *Inter situ* genetic conservation is the maintenance of tree populations established in progeny, provenance, and other genetic tests, for which there is specific genetic information available.

Resilience outcome and objective

Outcome: Trees are well adapted to the projected climate of the areas in which they are planted, contain adequate genetic diversity, and form part of diverse forest ecosystems across the landscape.

OBJECTIVE 2

By 2050, high-quality genecology research information will guide operationally efficient climate-based seed transfer policy and practice for all trees planted in BC.

Tree populations are adapted to climate envelopes. Seed transfer policy developed by the Ministry of Forests and Range includes the breadth of available information on patterns of genetic diversity, adaptation, and climatic conditions. This policy supports the planting of seedlots in climate areas to which they are properly adapted, maintaining and enhancing stand resilience and long-term timber supply. Seed transfer policy must also be operationally efficient to reduce seed inventory and seedling procurement costs.

Information needs for scientifically-based and operationally efficient seed transfer policy require investments in genecology research, climate modelling, and seed transfer system development. The following activities will be undertaken to achieve this objective:

- Implement a province-wide climate-based seed transfer system.
- Adjust FGC programs and information systems to support priority operational seed production under new seed zones.
- Conduct progressive, field-based research on the natural patterns of genetic diversity for all species planted in BC.
- Model climates to understand how climate envelopes currently occupied by indigenous tree populations will change over time.

Reporting: Progress on the implementation of science-based seed transfer standards, that consider climate change, will be tracked and reported annually. The performance indicator will be the percentage of seedlings planted under climate-based seed transfer standards.

Value outcome and objectives

Outcome: Sufficient seed of high genetic value is produced through tree breeding, seed-on-hand production, and related activities to meet reforestation objectives and enhance timber supply and quality.

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Information needs for
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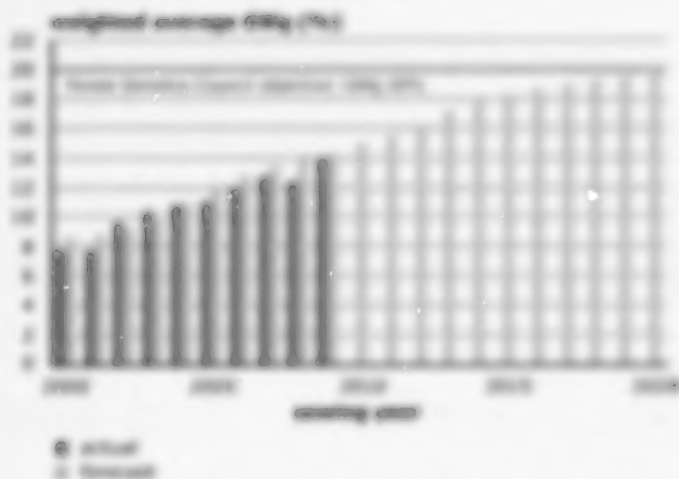
Figure 3

Estimated actual and forecasted growth of wood used for forest land enhancement in 2010 by the year 2020

Gains in commercial timber require efficient tree improvement programs including tree breeding and the coordination of breeding with wood on hand¹ operations. Tree improvement activities will be carried out only in wood planning units² with sufficient wood demand and timber production capacity to warrant investment. The following activities will be undertaken in support of this objective:

- Science-based tree breeding and testing programs for wood planning units meeting investment criteria;
- Development of human resources in the Ministry of Forests and Range Research Branch to ensure programs are supported by capable expertise;
- Coordination of planning between breeding programs and wood on hand³ to ensure the timely upgrading of wood on hand to incorporate the best available selections from breeding programs.

Reporting: Progress towards objective 1 will continue to be tracked using the weighted average growth worth for growth for all on hand woodlands over a given year (Figure 3).



¹Wood on hand is the predominant means for producing value-added products (lumber, biomass, regenerative production systems are included presently within other).

²Wood planning units (WPU) are defined as specific geographic areas with sufficient timber production capacity to warrant investment in tree breeding programs and wood on hand (regenerative systems).

Figure 3
Estimated actual and forecasted growth of wood used for forest land enhancement in 2010 by the year 2020

52

Figure 3
Actual and forecasted growth of wood used for forest land enhancement in 2010 by the year 2020

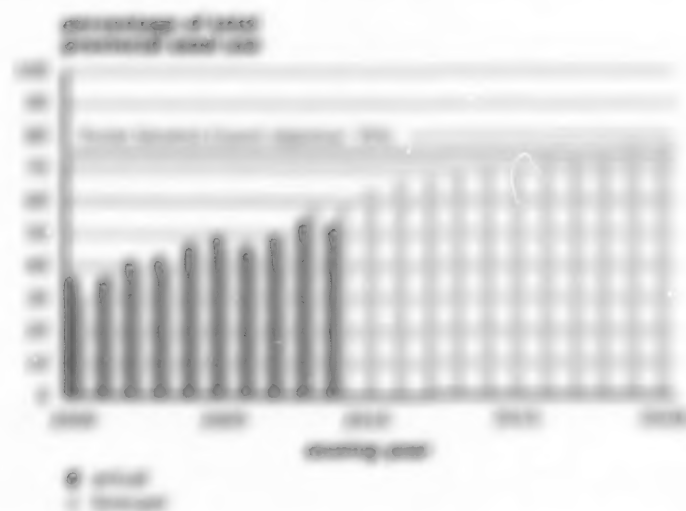
ANNEX 2

Percentages of total project cost for 1990-1991 and 1992-1993

The following table shows the percentage of total project cost for 1990-1991 and 1992-1993. The table is divided into two main categories: 1990-1991 and 1992-1993. The 1990-1991 category is further divided into two sub-categories: 1990-1991 and 1992-1993. The 1992-1993 category is further divided into two sub-categories: 1992-1993 and 1993-1994. The table shows the percentage of total project cost for each of these categories.

- 1. Development and planning of the project: 1990-1991, 1992-1993, 1993-1994.
- 2. Support for the project: 1990-1991, 1992-1993, 1993-1994.
- 3. Development and maintenance of infrastructure: 1990-1991, 1992-1993, 1993-1994.
- 4. Facilitation of the project: 1990-1991, 1992-1993, 1993-1994.

Support for the project: 1990-1991, 1992-1993, 1993-1994. The percentage of total project cost for each of these categories is shown in the following table.



The following table shows the percentage of total project cost for 1990-1991 and 1992-1993. The table is divided into two main categories: 1990-1991 and 1992-1993. The 1990-1991 category is further divided into two sub-categories: 1990-1991 and 1992-1993. The 1992-1993 category is further divided into two sub-categories: 1992-1993 and 1993-1994. The table shows the percentage of total project cost for each of these categories.

Monitoring effectiveness

It is essential to regularly monitor the effectiveness of the plan and to report on progress to the appropriate stakeholders. Monitoring should be carried out at regular intervals and should be a key part of the plan. The plan should be reviewed and updated as necessary to ensure it remains relevant and effective.

Conclusion

The plan should be reviewed and updated as necessary to ensure it remains relevant and effective. The plan should be a key part of the overall strategy and should be used to monitor progress and effectiveness.

The following are the key points to consider when developing a plan:

1. The plan should be clear and concise.
2. The plan should be realistic and achievable.
3. The plan should be flexible and adaptable.
4. The plan should be monitored and evaluated regularly.

Developing a plan is a key part of the overall strategy and should be used to monitor progress and effectiveness. The plan should be reviewed and updated as necessary to ensure it remains relevant and effective.

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101
 A person standing
 in a field, looking
 towards the camera.
 101

102
 A person standing
 in a field, looking
 towards the camera.
 102

Counting, Overlapping

The following exercises are designed to help you understand the concept of counting, overlapping, and the principle of inclusion-exclusion.

1. A set of 100 elements is divided into two subsets, A and B. If A has 60 elements and B has 40 elements, how many elements are in the intersection of A and B?
2. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of A, B, and C?
3. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of A and B?
4. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of A and C?
5. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of B and C?
6. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of A, B, and C?
7. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of A, B, and C?
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9. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of A, B, and C?
10. A set of 100 elements is divided into three subsets, A, B, and C. If A has 60 elements, B has 40 elements, and C has 30 elements, how many elements are in the intersection of A, B, and C?



Structural and Manufacturing

The structural design of a building is the most important aspect of the design process. It determines the overall form and function of the building and is the basis for all other design decisions. The structural design process involves a series of steps, from conceptual design to final construction.

1. Conceptual Design



2. Manufacturing Design

The manufacturing design process is the second most important aspect of the design process. It determines the overall form and function of the building and is the basis for all other design decisions. The manufacturing design process involves a series of steps, from conceptual design to final construction.



Business Planning

FGC Business Plan development

Council will annually develop a Business Plan and report on progress using performance indicators. Figure 5 illustrates the relationship among Council, subcommittees, and Business Plan development.



66
Council will annually
develop a Business Plan
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using performance
indicators.

Figure 5
Committee structure and
development of annual FGC
Business Plans.

